What is claimed is:

1. A vacuum plasma processor for processing workpieces comprising a vacuum chamber having an inlet for supplying gas to the chamber; an electrode arrangement, including a semiconductor member, for ionizing gas in the chamber to a plasma, a coil outside the chamber for generating an electromagnetic field for ionizing gas in the chamber to a plasma, a non-magnetic metal arrangement interposed between the coil and the semiconductor member; the coil, non-magnetic metal arrangement and semiconductor member being positioned and arranged for preventing substantial electric field components of the electromagnetic field from being incident on the semiconductor member while enabling substantial electric and magnetic field components from the coil to be incident on the gas for ionizing the gas.

2. The vacuum plasma processor of claim 1 wherein the chamber includes a dielectric window interposed between the coil and the chamber and arranged for coupling the electromagnetic field to the chamber.

3. The vacuum plasma processor of claim 2 wherein the dielectric window is interposed between the coil and the semiconductor member.

4. The vacuum plasma processor of claim 3 wherein the non-magnetic metal arrangement includes a member abutting the semiconductor member.

5. The vacuum plasma processor of claim 3 wherein the non-magnetic metal arrangement includes a member that is spaced from the semiconductor member.

6. The vacuum plasma processor of claim 3 wherein the non-magnetic metal arrangement includes first and second members respectively abutting and spaced from the semiconductor member.

7. The vacuum plasma processor of claim 3 wherein the dielectric window, semiconductor member and non-magnetic metal arrangement are in a roof structure of the chamber, the chamber having a center portion, the coil having

an interior portion that is spaced from the chamber center portion so peripheral portions of the semiconductor member are outside the coil interior portion, the non-magnetic metal arrangement having peripheral portions spaced from the chamber center portion by approximately the same distance as the semiconductor member peripheral portions.

8. The vacuum plasma processor of claim 7 wherein the non-magnetic metal arrangement includes first and second members respectively abutting and spaced from the semiconductor member, the first non-magnetic metal member having a periphery slightly outside the periphery of the semiconductor member, the first and second non-magnetic metal members having approximately aligned peripheries.

9. The vacuum plasma processor of claim 7 wherein the chamber has a circular interior wall having a first diameter, the non-magnetic metal arrangement including a member having a circular periphery having a second diameter, the semiconductor member having a circular periphery having a third diameter; the chamber interior wall, the non-magnetic metal member and the semiconductor member being co-axial, the first diameter being greater than the second diameter, and the second diameter being approximately equal to the third diameter.

10. The vacuum plasma processor of claim 9 wherein the coil is substantially co-axial with the chamber interior wall and has a substantially circular innermost turn having a diameter approximately equal to the third diameter.

11. The vacuum plasma processor of claim 10 wherein the non-magnetic metal member is adjacent the semiconductor member and the second diameter is slightly greater than the third diameter.

12. The vacuum plasma processor of claim 10 wherein the non-magnetic metal member is adjacent the coil and has a diameter slightly less than the interior diameter of the coil innermost turn.

13. The vacuum plasma processor of claim 10 wherein the non-magnetic metal arrangement includes first and second circular members co-axial with the chamber interior wall, the first circular member being adjacent the semiconductor member and the second diameter being slightly greater than the third diameter, the second circular member being adjacent the coil and having a diameter slightly less than the interior diameter of the coil innermost turn.

14. The vacuum plasma processor of claim 13 wherein the first circular member abuts the semiconductor member and is carried by the dielectric window so the semiconductor member is in the chamber, the second circular member and the coil being carried by the dielectric window so they are outside the chamber, the periphery of the second member being electrically insulated from the coil.

15. The vacuum plasma processor of claim 1 further including a workpiece holder in the chamber having a workpiece bearing surface and a drive for varying the distance between the workpiece bearing surface and the coil.

16. The vacuum plasma processor of claim 15, further including an RF source for applying RF bias to the workpiece via the workpiece holder.

17. The vacuum plasma processor of claim 1 further including a workpiece holder in the chamber, and a source for supplying an RF bias to the workpiece via the workpiece holder.

18. The vacuum plasma processor of claim 1 further including a power supply arrangement for supplying RF ion energization to the coil and the workpiece and for supplying (a) voltages to the semiconductor member and the non-magnetic metal arrangement and (b) a reference voltage to a metal wall of the chamber.

19. The vacuum plasma processor of claim 18 wherein the power supply arrangement is arranged for supplying the reference voltage to the semiconductor member.

20. The vacuum plasma processor of claim 19 wherein the power supply arrangement is arranged for supplying the reference voltage to the non-magnetic metal arrangement.

21. The vacuum plasma processor of claim 18 wherein the power supply arrangement is arranged for supplying the reference voltage to the non-magnetic metal arrangement.

22. The vacuum plasma processor of claim 18 wherein the power supply arrangement is arranged for supplying an RF energization voltage to the semiconductor member.

23. The vacuum plasma processor of claim 1 wherein the semi-conductor member has an electrical conductivity greater than 0.01 mho/cm.

24. The vacuum plasma processor of claim 1 wherein the semi-conductor member has an electrical conductivity greater than 0.1 mho/cm.

25. A vacuum plasma processor for processing workpieces comprising a vacuum chamber having an inlet for supplying gas to the chamber; an electrode arrangement, including a semiconductor member, for ionizing gas in the chamber to a plasma, a coil outside the chamber for generating an electromagnetic field for ionizing gas in the chamber to a plasma, a non-magnetic metal arrangement interposed between the coil and the semiconductor member; the coil, non-magnetic metal arrangement and semiconductor member being positioned and arranged so (a) no portion of the semiconductor member is outside the interior of an inner turn of the coil and (b) the non-magnetic metal arrangement includes a member having a periphery approximately aligned with the interior of the coil inner turn.

26. The vacuum plasma processor of claim 25 wherein the chamber includes a dielectric window interposed between the coil and the chamber and arranged for coupling the electromagnetic field to the chamber.

27. The vacuum plasma processor of claim 26 wherein the chamber has a circular interior wall having a first diameter, the non-magnetic metal

arrangement including a member having a circular periphery having a second diameter, the semiconductor member having a circular periphery having a third diameter; the chamber interior wall, the non-magnetic metal member and the semiconductor member being co-axial, the first diameter being greater than the second diameter, and the second diameter being approximately equal to the third diameter.

28. The vacuum plasma processor of claim 27 wherein the coil is substantially co-axial with the chamber interior wall and has a substantially circular innermost turn having a diameter approximately equal to the third diameter.

29. The vacuum plasma processor of claim 28 wherein the non-magnetic metal member is adjacent the semiconductor member and the second diameter is slightly greater than the third diameter.

30. The vacuum plasma processor of claim 28 wherein the non-magnetic metal member is adjacent the coil and has a diameter slightly less than the interior diameter of the coil innermost turn.

31. The vacuum plasma processor of claim 28 wherein the non-magnetic metal arrangement includes first and second circular members co-axial with the chamber interior wall, the first circular member being adjacent the semiconductor member and the second diameter is slightly greater than the third diameter, the second circular member being adjacent the coil and has a diameter slightly less than the interior diameter of the coil innermost turn.

32. The vacuum plasma processor of claim 31 wherein the first circular member abuts the semiconductor member and is carried by the dielectric window so the semiconductor member is in the chamber, the second circular member and the coil being carried by the dielectric window so they are outside the chamber, the periphery of the second member being electrically insulated from the coil.

33. A method of removing material from a workpiece in a vacuum plasma processing chamber including first and second spaced plasma excitation

electrodes, one of which includes a semiconductor interposed between a plasma excitation coil and gas in the chamber, comprising removing the material during a first interval by energizing the coil so it supplies an RF ionizing electromagnetic field to the gas, the RF ionizing electromagnetic field having magnetic field components that are coupled through the semiconductor to the gas and electric field components that are coupled to the gas without being intercepted by the semiconductor, the electromagnetic field having sufficient power to cause a plasma resulting from the gas to be sufficiently energetic to etch the material, removing the material during a second interval by energizing the electrodes so they supply an RF ionizing electromagnetic field to the gas, the RF ionizing electromagnetic field being coupled between the electrodes to the gas and material.

34. The method of claim 33 further including maintaining the chamber in a vacuum state between the first and second intervals.

35. The method of claim 34 further including cleaning the chamber during a third interval by energizing the coil so it supplies an RF ionizing electromagnetic field to the gas, the RF ionizing electromagnetic field derived during the third interval having magnetic field components that are coupled through the semiconductor to the gas and electric field components that are coupled to the gas without being intercepted by the semiconductor, the electromagnetic field derived during the third interval having sufficient power to cause a plasma resulting from the gas to be sufficiently energetic to etch material deposited on interior surfaces of the chamber, and maintaining the chamber in the vacuum state during the third interval, and between the first and third intervals, and between second and third intervals.

36. The method of claim 33 wherein the material includes a dielectric layer that is etched during the second interval.

37. The method of claim 33 wherein the material includes an underlayer that is etched during the second interval.

38. The method of claim 33 wherein the material includes a photoresist layer that is etched during the second interval.

39. The method of claim 33 wherein the material includes photoresist that is stripped from the workpiece during the first interval.